Application for Permit for Scientific Purposes and to Enhance the Propagation or Survival of Listed Species under the Endangered Species Act of 1973:

1.0 Name of Program: Smolt Trap Operation in the Okanogan River to Monitor Populations of Anadromous Salmonids as part of a Basin-Wide Status, Trend and Effectiveness Monitoring Program.

2.0 Species:

ESU	Status	Federal Register Notice
Upper Columbia River Steelhead (*O. mykiss)*	Endangered	62 FR 43937 (August 18, 1997)

3.0 Date of Permit Application: January 17, 2005

4.0 Applicant:

Confederated Tribes of the Colville Reservation
P.O. Box 150
Nespelem, Washington 99155

Primary contact: John Arterburn, Fisheries Biologist
Colville Confederated Tribes
Telephone: (509) 422-7424
FAX: (509) 422-7428
john.arterburn@colvilletribes.com

5.0 Personnel, Cooperators and Sponsors:

Principle Investigator: John Arterburn
Colville Confederated Tribes
23 Brooks Tracts Road
Omak WA 98841
Phone: (509) 422-7424
FAX: (509) 422-7428
john.arterburn@colvilletribes.com

Field Supervisor: Paul Wagner
KWA Ecological Sciences Inc.
509-430-0005

pwagner@kwaecoscience.com

Field Personnel: Keith Kistler
Rhonda Dasher
Sidryn Sam
Smith Condon

Funding Source: Bonneville Power Administration
Columbia River Basin Fish and Wildlife Program
Project# 200302200
COTR Sarah Branum (503-230-5115)

Project Sponsor: Colville Confederated Tribes
Fish and Wildlife Department
Mr. Joe Peone, Director
P.O. Box 150
Nespelem, WA, 99155
(509) 634-2113
FAX (509) 634-2126
joe.peone@colvilletribes.com

6.0 Project Description, Purpose, and Significance:

As part of the implementation of a basin wide monitoring effort (BPA Project # 200302200, 2005 Statement of Work attached at end of document, see Work Element 11 regarding Smolt Trapping), the Colville Confederated Tribes (CCT), in coordination with the Washington Department of Fish and Wildlife (WDFW), National Oceanographic and Atmospheric Administration Fisheries (NOAA Fisheries), and the Bonneville Power Administration (BPA), propose to begin smolt trapping operations in the U.S. portion of the Okanogan Subbasin in year 2005. Smolt trapping in the Okanogan River will allow researchers to estimate natural production and productivity; calculate annual population estimates, egg-to-emigrant survival, and emigrant-to-adult survival rates. Population estimates will be used to evaluate the effects of supplementation programs in the Okanogan River Basin as well as to provide data to develop a spawner-recruit relationship.

6.1 Project Justification

The overarching project, of which the proposed work is a subset, seeks to develop two monitoring and evaluation programs: (i) subbasin-scale pilot status and trend monitoring efforts for anadromous salmonids and their habitat in the Okanogan River basin, and (ii) effectiveness monitoring for suites of management actions and habitat restoration projects in selected watersheds within the subbasin. This work builds on, is in coordination with, and complements current status and trend monitoring programs within the basin; expanding on the utility of status monitoring data to

explicitly address watershed-scale questions of management and habitat restoration action effectiveness.

Data from the effectiveness monitoring program will be used for a variety of resource management purposes. The primary utility of the information will be an assessment of the biological impact of management and restoration actions on anadromous salmonids. These data will be developed as a comparative assessment of abundance and productivity of anadromous salmonids on the scale of watersheds within the Okanogan River basin as a function of habitat characteristics and the aggregate impact of management and restoration actions.

Benefit to listed fish will accrue in three different ways: (i) through the generation of information that supports management of these species with respect to exploitation and recovery planning; (ii) through the generation of information that supports the planning, development and implementation of restoration and recovery actions that directly benefit the listed populations; and (iii) through the generation of information that supports the planning, development and implementation of management actions that indirectly impact the listed population.

Listed fish will benefit directly and indirectly through the development of a comprehensive status and trend monitoring program in the Okanogan River basin because Federal, State and Tribal resource managers will have population and habitat data of known quality (spatio-temporal resolution, as well as of known accuracy and precision) upon which to base resource management decisions. Additionally, quantifying the impacts of restoration, recovery and other resource management actions on populations of listed anadromous salmonids at the watershed scale within the Okanogan River basin is of critical direct benefit to these fishes. Hundreds of millions of dollars have been spent on habitat and population manipulation actions with little or no rigorous assessment of the biological impact these actions had on populations of listed anadromous salmonids. This issue is a critical shortcoming of many regional management plans, is acknowledged to be of high priority, but is only occasionally addressed during the design and implementation of action or monitoring programs. The proposed work here directly addresses this issue by integrating multiple watersheds within the Okanogan River basin in a sub-basin scale monitoring program that captures population productivity and abundance metrics, and the aggregation of past and on-going management actions.

6.2 Federal recommendation and/or requirement for program

The proposed project, both the specific aspects described in this application as well as the overarching monitoring program, are specifically called for in the implementation plan for the 2000 FCRPS Biological Opinion (NMFS 2000a, RME Plan 2003). In addition, the proposed work is a part of a larger project to develop consistent, coordinated status and effectiveness monitoring for the Columbia River Basin that

meets the needs of the Federal Caucus Basinwide Recovery Strategy (Federal Caucus 2000).

6.3 Significance to large-scale restoration and research management

There have been numerous recent administrative and scientific calls for a comprehensive monitoring and evaluation program to provide consistent, region-wide information about the status of salmon populations and their response to management actions (Botkin *et al.* 2000, ISAB 2001, RSRP 2001). In addition, the 2000 Biological Opinion on the Federal Columbia River Power System requires the development and implementation of a coordinated monitoring and evaluation program (NMFS 2000a). The call for developing a consistent, region-wide monitoring program has been strong and widespread because once implemented, such a program will address a number of outstanding scientific agendas. The comprehensive monitoring program will provide a scientifically robust method to evaluate the status of populations and ESUs, and thereby gauge progress toward recovery goals, such as the de-listing criteria defined by the regional TRT's (NMFS 2000b) and provide the means to develop and refine appropriate performance measures and standards for conservation actions giving managers the tools to assess quantitatively the impact of single or composite actions on fish populations, thereby increasing our ability to conduct effective recovery planning. The proposed study is a small but important component of the larger comprehensive monitoring plan.

The pilot status, trend and effectiveness monitoring program will address not only these scientifically-based policy agendas, but will also provide the framework in which to address a substantive administrative issue – implementing the requirements for developing the monitoring and evaluation program outlined in the NMFS 2000 Biological Opinion on the Federal Columbia River Power System (Actions 180-184, 188, 190, 191, 193, and 195-7), specifically, population and habitat status monitoring for anadromous salmonids as required under Action Item 180, and elements of the habitat action effectiveness monitoring as required under Action Item 183.

A well-designed monitoring and evaluation program is a critical component of any conservation or restoration activity. Monitoring is vital in determining whether specific management actions have been effective, and large-scale monitoring and evaluation is important in assessing the success of integrated actions having achieved desired population size, distribution and trends. Moreover, well-coordinated management actions, when coupled with relevant monitoring and evaluation programs, can reduce uncertainty about the effect of those actions on population productivity.

The primary goal of this large-scale monitoring and evaluation effort is to design and implement a system of statistically rigorous data collection schemes to answer questions fundamental to the management and recovery of anadromous salmonids. In spite of tremendous past efforts many of the most important questions remain

unanswered due to basic uncertainties in these fishes' population processes, both with respect to trends in abundance as well as the factors that regulate salmonid population dynamics.

At present there are a number of high-quality population and habitat monitoring and assessment programs within the Columbia River Basin (e.g. Oregon Plan 1997; Alverts *et al.* 1997, CBFWA 2001). However, none of these programs has both comprehensive geographic coverage and a sampling theoretic basis. In particular, there are no comprehensive guidelines to be drawn from these plans that can be used as a template for monitoring the status and recovery of impacted populations as well as their breeding, rearing and migratory corridor habitat in the entire Columbia River Basin. At issue is both the type of data traditionally collected to assess population and habitat status, as well as the manner by which the data collection scheme is implemented in time and space.

The primary objective of the comprehensive monitoring plan (of which the proposed action is a small component) is a statistically sound sampling design that when implemented will generate useful data with known analytical and predictive power. Several technical challenges are immediately apparent, and this work is distinct from previous efforts in how we will approach these challenges. The primary complication arises from the enormous spatial scale and resulting heterogeneity of the sampling areas and indicators. As such, the manner of population and habitat sampling, and the manner in which the samples are distributed in time and space, will strongly influence the assessment of status and effectiveness. To satisfy this constraint requires considerable knowledge of both the spatial extent of true demographic units and the mechanisms of population regulation, potentially more than we currently possess. However, lacking these key pieces of information does not mean that we are unable to accurately assess population and habitat status, but it does mean that we must do so under a modern and statistically rigorous sampling program informed by our knowledge of demographic and habitat processes. This work is intended to develop and test status, trend, and effectiveness monitoring approaches capable of the statistical rigor specifically required by the region's natural resource management agencies and personnel.

6.4 Relationship to ongoing hatchery evaluation and habitat projects in the Okanogan River Basin

WDFW, as part of the Wells Hatchery Program, currently release 10,000 and 250,000 yearling summer/fall Chinook in the Okanogan Basin from the Bonaparte and Similkameen acclimation facilities respectively. WDFW annually conduct summer/fall Chinook redd counts and carcass surveys throughout the U.S. portion of the Okanogan basin as part of the evaluation of the Wells Hatchery Program. In addition, the Chief Joseph Hatchery Program is scheduled to begin operation in year 2008 with an annual production goal of 2 million summer/fall Chinook smolts (700,000 Ch-0, 1,300,000 Ch-1) to be released in the Okanogan subbasin and in the mainstem Columbia River below Chief Joseph Dam. The Chief Joseph Hatchery Monitoring and Evaluation Program will be conducted in close coordination with the Okanogan Basin Monitoring and Evaluation Program and together these two complementary programs will determine the extent of natural summer/fall Chinook production and the success of hatchery supplementation in the Okanogan River. Smolt trapping has not been conducted in the Okanogan subbasin prior to the effort proposed here. Smolt trapping of zero age summer Chinook outmigrating from the Okanogan subbasin will assist managers in determining baseline wild production, outmigration timing, egg to emigrant and smolt to adult survival rates, and changes in the abundance of naturally produced juvenile summer/fall Chinook which may occur over time in response to hatchery enhancement activities.

The WDFW annually releases 80,000 yearling steelhead into the Okanogan subbasin as part of the Wells Hatchery Program. In addition, the Colville Confederated Tribes trap adult steelhead in Omak Creek to provide local broodstock for an artificial propagation enhancement program which produces 9,000 yearling steelhead annually for release back into Omak Creek. Redd counts have been conducted in Omak Creek but not elsewhere in the Okanogan subbasin and therefore the extent of natural steelhead production throughout the subbasin is unknown. Steelhead redd count surveys throughout the U.S. portion of the Okanogan subbasin will begin in 2005 under the Okanogan Basin Monitoring and Evaluation Program. Similar to that stated above for trapping of zero age summer Chinook, the proposed trapping of juvenile steelhead will assist managers in determining baseline wild production, outmigration timing, egg to emigrant and smolt to adult survival rates, and changes in the abundance of naturally produced juvenile steelhead which may occur over time in response to hatchery enhancement activities. Such information will be essential in determining if recovery goals are being met.

7.0 Methods:

7.1 Site Description: The rotary smolt trap will be placed at RM 16.9 on the Mainstem Okanogan River. The proposed smolt trap location is on Colville Confederated Tribal Reservation land within the mainstem corridor and downstream of the Malott Eastside South Road Bridge (Figure 1).

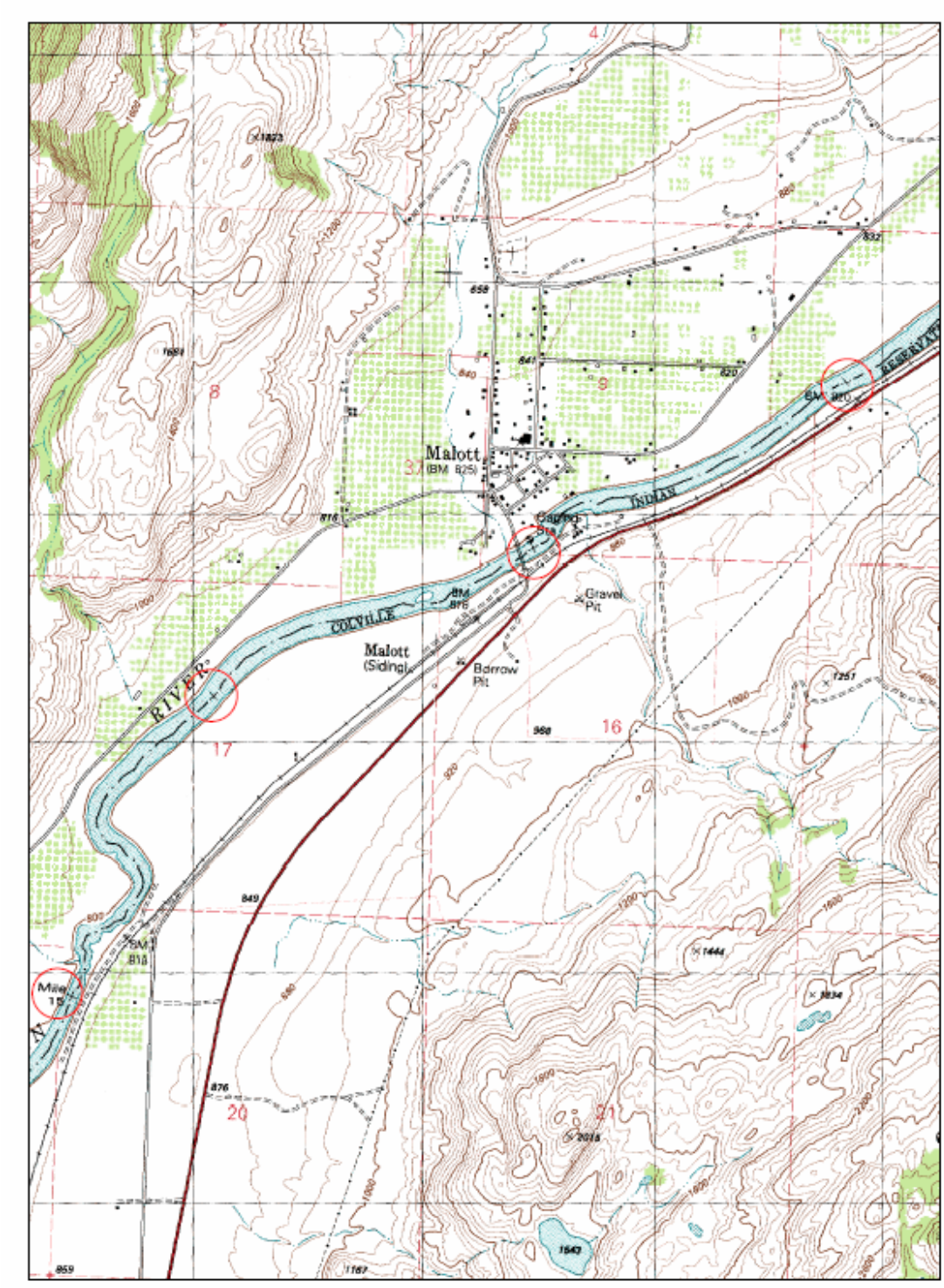
Malott
(BM 825)
Malott
(Siding)
Gravel Pit
Borrow Pit
COLVILLE
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Figure 1. Project map; smolt trap location at River Mile 16.9 in Okanogan River, Washington.

7.2 Project Duration: The smolt trap will be operated annually between March 1 and October 1.

7.3 Procedures and Techniques:

Operating procedures and techniques described were adapted from Murdoch et al. (2000) and incorporated into a standardized basin-wide monitoring plan developed by the Upper Columbia Regional Technical Team for the Upper Columbia Salmon Recovery Board (Hillman 2004).

The trap live box will be checked a minimum of once a day (morning) or more often as needed due to debris and fish movement. All fish will be removed from the live box and placed into an anesthetic solution of MS-222. We will identify species and enumerate all fish captured to include life stage (e.g. fry, juvenile, and adult) for non-anadromous species, or degree of smoltification (i.e., parr, transitional, or smolt) for anadromous species. All fish will be examined for external marks and PIT tags as a result of trap efficiency trials and recorded as recaptures. From the first 25 individuals of each species, we will measure fork length (FL) to the nearest millimeter and weight to the nearest tenth of a gram. A Fulton-type condition factor will be calculated following methods described in Anderson and Neumann (1996). DNA samples from a systematic sample of smolts will be collected and analyzed according to the protocols being refined at the WDFW Genetics Lab. All fish will be allowed to fully recover in fresh water prior to being released in an area of calm water downstream from the smolt trap. Every time the live box is checked we will record the time, water temperature, and staff gauge height. River discharge for trapping days will be obtained through the Washington State Department of Ecology (DOE).

We will use mark-recapture trials for target species to develop a discharge-trap efficiency linear regression model to estimate daily trap efficiency. The mark-recapture trials will be conducted throughout the trapping season for the largest range of discharge possible. No less than 100 fish will be used for each mark-release trial. Parr and smolts will be marked by clipping the tip of either the upper or lower lobe of the caudal fin, alternating fin clip locations for each trial, or by PIT tagging. All marked fish will be allowed to recover in a live pen for at least 8 hours before being transported to a release site at least 1 km upstream of the trap. When possible we will release marked fish across the width of the river, or equally along each bank in pools or calm pockets of water. Trap efficiency and populations estimates will be calculated as described in Murdoch et al. (1999) and Hillman (2004).

8.0 Description and Estimates of Take:

Listed species affected by the proposed project can be found in Table 1.

Table 1. Listed species, ESU, status and federal register notice.

ESU	Status	Federal Register Notice
Upper Columbia River Steelhead, *Oncorhynchus mykiss*	E	62 FR 43937 (August 18, 1997)

8.1 Upper Columbia River Steelhead

8.1.1 Current Status of UCR Steelhead

The upper Columbia River steelhead ESU, listed as endangered on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S. Canada border. The WDFW Wells Hatchery steelhead stock is considered essential for recovery, and is included in the listing. This entire ESU has been subjected to heavy hatchery influence; stocks were mixed as a result of the Grand Coulee Maintenance Project, which began in the 1940s (Fish and Hanavan 1948, Mullan et al. 1992a). The current status of Upper Columbia River Steelhead is detailed in NOAA 2003a.

8.1.2 Estimated Impacts to Naturally Produced and Hatchery UCR Steelhead

Hatchery steelhead broodstock are collected at Wells Dam to produce a target release into the Okanogan subbasin of 100,000 yearling steelhead smolts (NOAA Fisheries 2003). Natural production for the Methow/Okanogan subbasins is estimated to average 9% of total production (NOAA Fisheries 2003). We expect mortality to be less than two percent on listed species (NOAA 2003a). Assuming a total combined production level of 109,000 smolts, a maximum trap efficiency of 20% on yearling steelhead, and a maximum mortality rate of 2%, this results in a maximum loss of 436 smolts (400 hatchery origin, 36 natural origin). Converting this to adult equivalents (three percent survival smolt-to adult, Ford et al. 2001) results in a maximum loss of up to 12 hatchery produced and 2 naturally produced adult UCR steelhead.

Table 3. Maximum estimated proportional non-lethal and lethal take of natural and hatchery produced ESA listed Upper Columbia River steelhead.

Proposed Activity	Naturally Produced UCR Steelhead		Hatchery UCR Steelhead	
	non-lethal	*Lethal (indirect mortality)*	*non-lethal*	*Lethal (indirect mortality)*
Operation of a rotary smolt trap in Okanogan River to provide baseline population and emigration data for anadromous salmonids	20%	2.0%	20%	2.0%

9.0 Previous or Concurrent activities involving listed and endangered species

National Marine Fisheries Service Section 10(a)(1)(A) Permit for Takes of Endangered /Threatened Species
Permit Number: 1412
Permit Type: Direct Take (artificial propagation to enhance ESA-listed steelhead)

This permit authorizes the Colville Tribes annual take of ESA-listed adult and juvenile, endangered, naturally produced and artificially propagated, UCR steelhead and UCR spring chinook salmon associated with the implementation of an UCR steelhead artificial propagation enhancement program in the Okanogan River. The program is intended to supplement naturally spawning UCR steelhead production in the Okanogan River.

The artificial propagation enhancement program is intended to help rebuild natural production of UCR steelhead in the Okanogan River basin. The programs will lead to intentional take to enhance the propagation of endangered UCR steelhead. The artificial propagation programs may lead to incidental take of rearing and emigrating juvenile UCR spring chinook salmon and steelhead resulting from the release of artificially propagated steelhead juveniles into the natural environment.

Steelhead artificial propagation enhancement program activities will include:
• Collection of broodstock from the Omak Creek or Okanogan River;
• The holding and artificial spawning of broodstock at a hatchery facility;
• The incubation and propagation from the fertilized egg through the fingerling, pre-smolt or smolt life stage at the Colville Tribal Hatchery;
• The release of juvenile steelhead into the Okanogan River.

10.0 Certification

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand this information is submitted for the purpose of obtaining a permit under the Endangered Species Act of 1973 (ESA) and regulations promulgated thereunder, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties under the ESA."

1/16/ 2005

Signature Date

Joe Peone
Fish and Wildlife Program Director

11.0 Literature Reviewed and Cited

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Mullan, J.W., A. Rockhold, and C.R. Chrisman. 1992. Life histories and precocity of chinook salmon in the mid-Columbia River. Progressive Fish-Culturist 54:25-28.

Murdoch, A., K. Petersen, T. Miller, M. Tonseth, and T. Randolph. 2000. Freshwater production and emigration of juvenile spring chinook from the Chiwawa River in 1999. *Prepared for:* Public Utility District Number 1 of Chelan County. Wenatchee, WA.

Murdoch K.G., S.A. Prevatte, C.M. Kamphaus. In Prep. Feasibility and risks of coho reintroduction into mid-Columbia Tributaries: Draft 2003 monitoring and evaluation report. *Prepared for:* Bonneville Power Administration, Portland OR. Project number 1996-040-000.

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11. Curriculum Vitae

John Arterburn
706 Wildwood Road
Omak, WA 98841
john.arterburn@colville tribes.com

Education

MASTER'S OF SCIENCE IN FISHERY SCIENCE JUNE 1999- MAY 2001
South Dakota State University Brookings, SD

- Advisor: Dr. Charles R. Berry Jr.
- GPA 3.75
- Named outstanding Masters student for 2001by the Great Plains Fishery Workers Association

BACHELOR OF SCIENCE IN FISHERY BIOLOGY JANUARY 1997-MAY 1999
Colorado State University Fort Collins, CO

- Advisor: Dr. Brett Johnson

- GPA 3.48
- Named the outstanding senior in fishery biology for 1999

GENERAL STUDIES JANUARY-1994-DECEMBER 1996
Front Range Community College Fort Collins, CO

- GPA 3.74
- Dean's list three out of five semesters

Published Manuscripts

1. Arterburn J. E. In Press. Colville Reservation Lakes Compendium, Limiting Factors, and Management Plan. Report CCT/RF-2003-2, Revised for 2003. Colville Confederated Tribes. Nespelem, WA.

2. Arterburn J. and D. Christensen 2003. Colville Tribal Fish Hatchery Annual report for 2002. Report # CCT/RF-2003-1. BPA project # 198503800, Colville Confederated Tribes. Nespelem, WA.

3. Arterburn J. E. 2002. Colville Tribal Hatchery production report for 2000 and 2001. BPA project # 198503800, Colville Confederated Tribes. Nespelem, WA.

4. Arterburn J. E., and C. R. Berry Jr. 2002. Hook styles, bait types and river location for sampling catfish with trotlines. North American Journal of Fisheries Management. 22(2):573-578.

5. Arterburn J. E., D. J. Kirby, and C. R. Berry Jr. 2002. A survey of angler attitudes and biologists opinions regarding trophy catfish and their management. Fisheries 27(5):10-21.

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9. Arterburn, J. 2000. Clear as gin or chocolate milk: South Dakota's east river streams are quality fisheries. South Dakota Conservation Digest 67(2):5-9.

Fishery Related Employment

Off Reservation Biologist-(FISHERY BIOLOGIST II) **APRIL 2003-PRESENT**
Colville Confederated Tribes- Fish and Wildlife Department
Supervisor Jerry Marco *Omak, WA*

Job responsibilities include: Protect, conserve, and enhance the anadromous fisheries resources for the Colville Confederated Tribes on reservation lands and in all usual and accustomed areas. Work to restore spring chinook salmon and summer steelhead stocks listed as endangered within the upper Columbia environmentally significant unit. Coordinate and provide fisheries expertise to: the Columbia Basin Fish and Wildlife Authority-Resident Fish Committee, Okanogan Subbasin Habitat Working Group, Intermountain Province-Oversight, Advisory and Technical Committees, San Poil Subbasin Working Group, Lake Rufus Woods Subbasin Working Group, Omak Creek Technical Advisory Group, Northwest Power Planning Councils-Artificial Production Review Committee, Okanogan First Nations (Canada), Washington Department of Fish and Wildlife, U. S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration-Fisheries, and Bonneville Power Authority. Conduct stream inventories, habitat assessments, passage barrier removal, limiting factor improvements, and research projects. Biological data collection, analysis, and interpretation for inclusion in management plans, presentations, manuscripts, biological assessments, grant proposals and used to adaptively manage sport and subsistence fisheries.

RESIDENT FISH MANAGER-(FISHERY BIOLOGIST II) **AUGUST 2001-APRIL 2003**
Colville Confederated Tribes- Fish and Wildlife Department
Supervisor Jerry Marco *Nespelem, WA*

Job responsibilities include: Protect, conserve, and enhance the resident fisheries resources of the 1.5 million acre Colville Reservation for the enjoyment of tribal members and non-member visitors. Manage resident fish populations and habitats by stocking fish, angler regulations, habitat improvements, and monitoring and evaluation activities. Coordinate and provide fisheries expertise to: the Columbia Basin Fish and Wildlife Authority-Resident Fish Committee, Intermountain Province-Oversight,

Advisory and Technical Committees, Northwest Power Planning Councils-Artificial Production Review Committee, Washington Department of Fish and Wildlife, U. S. Fish and Wildlife Service, and Bonneville Power Authority and consulted on projects and programs with other private, tribal and governmental agencies as needed. Provide oversight for the operations of the Colville Tribal Hatchery (minimum production 50,000 lbs of trout annually), lake and stream inventories, habitats assessment, passage barrier removal, limiting factor improvements, and research projects. Biological data collection, analysis, and interpretation for inclusion in management plans, presentations, manuscripts, grant proposals and used to adaptively manage sport and subsistence fisheries.

- Oversight of up to 20 full and part time employees.
- Administer BPA statements of work, budgets, contracts, and reporting for the Colville Tribal Hatchery, Lake Roosevelt Rainbow Trout Habitat Improvement and Joint Stock Assessment Projects.
- Projects initiated during my tenure included; developing an elastomer tagging program, the integration of triploiding technology, development of redband trout captive brood stock, design for Bridge Creek passage and sediment retention improvements, and renewable resource aeration systems.
- Developed level II data set for the Ecosystem, Diagnosis, and Treatment Model of the San Poil River Subbasin and participated in the development of reband trout rule set.
- Compiled current and historical data for the lakes of the Colville Reservation and conducted a Limiting Factors Analysis and facilitated electronic data consistency protocols to improve trend analysis.
- Employees participated in and developed programs for fish in the classroom, kids fishing ponds, trade show exhibitions, and professional training and certification.
- Participated in ecosystem management for the Columbia River system through the NWPPC sub-basin planning process and involvement with other BPA and power council related activities.

GRADUATE RESEARCH ASSISTANT JUNE 1999-AUGUST 2001
South Dakota State University- Department of Wildlife and Fisheries Sciences
Advisor Dr. Charles R. Berry Jr. Brookings, SD

Researched populations of channel and flathead catfish from the James and Big Sioux rivers located in Southeastern South Dakota. Population indices where developed for growth, relative abundance, relative weight, age frequency, and length frequency to establish baseline data. Correlation analysis was used to link annual discharge with cohort strength and population modeling used to make management recommendations for establishing a trophy catfish fishery. We developed a sampling protocol for future monitoring and identified the best gears for sampling catfish in these rivers. Trotline data was assessed, for bait, hook, and habitat type to quantify methods for trotline construction. We conducted a survey of catfish anglers and biologist to identify concerns and attitudes especially concerning trophy catfish throughout the Mississippi River Basin.

- Reviewed literature for background information
- Developed sampling protocol and methods for data collection.
- Collected data and aged spines.
- Entered, summarized, and analyzed data using parameteric and non-parametric statistics and state of the art fisheries software.

- Published and communicated results to professional and public audiences.

RESEARCH ASSISTANT (WORK-STUDY) SEPTEMBER 1998-MAY 1999
Colorado State University- Department of Fish and Wildlife
Biology under Dr. Brett Johnson Fort Collins, CO

Assisted with data collecting for thesis work on temperature control device affects on in-reservoir dynamics of Shasta Lake. Under supervision of PhD candidate Laurel Saito and Dr. Brett Johnson.

- Processed samples to analyze carbon 13 and nitrogen 15 to determine carbon source and trophic levels for several fish, macroinvertebrate, and planktonic species using VG Isochrom mass spectrometer and Carlo-Ebra NA1500 elemental analyzer.
- Stomach analysis for comparison of spectroscopy data.
- Preserved, stained and cleared specimens to facilitate stomach content identification to species level using bone structure for food habit study and correlation with radio-isotope results.

VOLUNTEER BIOLOGICAL SCIENCE TECHNICIAN JUNE 1997-JULY 1997
USGS-BRD Alaska Science Center-under Dr. Eric KnudsenAnchorage, AK

- Collected rainbow trout using hoop nets, minnow traps, hook and line, and seines.
- Identified and collected genetic samples from adult and juvenile rainbow trout and coho salmon.
- Tagged and marked fish by adipose clip, T-bar floy tags and surgically implanting radio transmitters.
- Monitored fish movements using radio telemetry with manual antenna and data loggers.
- National Park Service and Fish and Wildlife Service training for bear safety, aircraft safety, firearm safety (designated shooter rating) and motor boat operator certification.
- Hundreds of hours of small boat operation on rivers and ocean.
- Low impact camping techniques and public relations.

Affiliations and Honors

Colorado State University outstanding senior in fishery biology (1999)
- Member of American Fisheries Society
- Golden Key National Honor Society
- Xi Sigma Pi International Honor Society
- Vice President-Willow Lane Home Owners Association (1991-1999)

References

- Jerry Marco-Senior Fishery Biologist Colville Confederated Tribes Fish and Wildife Department. PO Box 150 Nespelem, WA 99155. (509)-634-2110. E-mail jerry.marco@colvilletribes.com.

- Dr. Charles R. Berry-Leader South Dakota Cooperative Research Unit South Dakota State University. NPBL, Room 138, Box 2140b Brookings, SD 57007-1696. (605)-688-6121. E-mail charles_berry@mg.sdstate.edu.

- Dr. David W. Willis-Professor South Dakota State University Department of Wildlife and Fisheries Sciences. NPBL, Room 138, Box 2140b Brookings, SD 57007-1696. (605)-688-6121. E-mail dave_willis@mg.sdstate.edu.

- Dr. Stephen Flickinger-Professor & interim Department Head Colorado State University Department of Fish and Wildlife Biology. 235 Wagar Fort Collins, CO 80523. (970)-491-5657. E-mail flick@cnr.colostate.edu.

- Dr. Brett Johnson-Professor Colorado State University Department of Fish and Wildlife Biology. 238 Wagar Fort Collins, CO 80523. (970)-491-5002. E-mail brett@cnr.colostate.edu.

- Dr. Eric Knudsen-Team Leader (Fisheries Research) USGS-BRD Alaska Science Center 1011 Tutor Anchorage, AK 99503. (907) 786-3649

PAUL G. WAGNER

EDUCATION

B.S., Fisheries, University of Washington, 1983.

PROJECT SPECIFIC QUALIFICATIONS

Mr. Wagner has over twenty years of experience as a professional fish biologist conducting work throughout the Columbia basin as well as in other anadromous waterways within the state of Washington, and in Oregon, Idaho, Montana, and Canada. His established skill set includes: designing, implementing, and presenting the results of aquatic research, monitoring, and evaluation projects; ability to supervise field, laboratory, and office staff; technical project oversight and review; grant writing; sub-basin planning; technical report writing and oral presentation; budget and project management; database management; coordination with federal, state (and provincial), and local government agencies and tribal groups in the U.S. and in Canada as well as with public organizations and media; Endangered Species Act compliance and permitting; adult and juvenile Salmonid passage facility design review, operation, and assessment; and habitat assessment.

From 1987 through year 2000 Mr. Wagner was the WDFW project leader for the Smolt Monitoring Program, Gas Bubble Trauma Assessment Program, and COE Juvenile Salmonid Transportation Quality Control Program at McNary, Ice Harbor, and Lower Monumental hydroelectric projects located on the Columbia and Snake Rivers. For ten years during this same time period, he developed and was the project leader of PIT tag studies to assess migration timing and survival of wild juvenile fall Chinook from the Hanford Reach of the Columbia River. He has been responsible for supervising large scale fish marking programs utilizing Floy tags, coded wire tags, fin clips, and freeze brands for a variety of scientific studies. He has extensive experience in handling and sampling juvenile Salmonids which has included responsibility for training both state and federal employees in Salmonid identification and safe handling procedures. Mr. Wagner was also a primary contributor to the development of anesthetic guidelines used at mainstem hydroelectric project juvenile Salmonid sampling facilities in the Columbia Basin. He has reviewed design specifications, operated, and evaluated juvenile collection systems at mainstem hydro-electric projects. He has been responsible for the development of specific fish injury assessment criteria and has worked extensively evaluating sources of fish injury at fish collection facilities. He developed and was the project leader of an evaluation of wild juvenile fall Chinook stranding on the Hanford Reach of the Columbia River. He has been responsible for securing both federal and state permits to conduct fish sampling in the waters of Washington, Oregon, and Idaho. In year 2004 he was responsible for supervising field crews conducting Effectiveness Monitoring of Washington State Salmon Recovery Funding Board (SRFB) projects throughout Eastern Washington. Most recently he integrated EMAP sampling protocols into a Monitoring and Evaluation Program for the Okanogan sub-basin on behalf of the Colville Tribes and has provided technical and field support for the implementation of this project. The smolt trapping activities described in this Section 10 Application are part of this Monitoring and Evaluation effort.

SELECT PROJECT EXPERIENCE AND REFERENCES

1990-2000 Smolt Monitoring Program **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Rod Woodin **Phone: (360) 902-2700**
Address: Natural Resources Building
1111 Washington Street SE
Olympia WA, 98504

While employed by the Washington Department of Fish and Wildlife, Mr. Wagner was the Smolt Monitoring Program supervisor at McNary, Ice Harbor, and Lower Monumental dams located on the Columbia and Snake rivers, respectively. This Bonneville Power Administration funded program involved: supervision and training of technical staff in Salmonid identification, handling, and anesthetization; daily fish sampling and reporting to the Fish Passage Center, extensive database work, coordination with U.S. Army Corps of Engineers biologists and project operators; coordination with multiple researchers at each project; gas bubble trauma examinations; PIT tagging of wild juvenile fall Chinook to determine run timing and relative survival rates; development of anesthetization guidelines; and an assessment of the use of clove oil as a fish anesthetic.

1987-2000 Fish Transportation Oversight **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Rod Woodin **Phone: (360) 902-2700**
Address: Natural Resources Building
1111 Washington Street SE
Olympia WA, 98504

While employed by the Washington Department of Fish and Wildlife, Mr. Wagner supervised quality control oversight of the U.S. Army Corps of Engineers Juvenile Salmonid Transportation Program at McNary, Ice Harbor, and Lower Monumental dams. The work involved: coordination and oversight of juvenile Salmonid research programs; inspection of juvenile bypass systems, adult fishways, and fish transportation vehicles; daily examination of smolts for condition assessment; training of COE technicians in fish identification and fish handling procedures; weekly dissemination of information to all Columbia Basin fish agencies and tribes; development of descaling criteria; thermal profiling; and review of juvenile bypass system design and operation specifications.

1994-1996 Juvenile Bypass System Evaluations **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Rod Woodin **Phone: (360) 902-2700**
Address: Natural Resources Building
1111 Washington Street SE
Olympia WA, 98504

While employed by the Washington Department of Fish and Wildlife, Mr. Wagner acted as the WDFW project leader in the evaluation of newly constructed juvenile fish bypass systems at McNary (1994) and Ice Harbor (1996) dams. The work involved mark/recapture of steelhead and Chinook smolts released in various system locations. This work was conducted under contract with the National Marine Fisheries Service (now NOAA Fisheries).

1992-1996 Adult Contribution Study **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Dennis Rondorf (USFWS Project Leader) **Phone: (509) 538-2299**
Address: Columbia River Research Laboratory
5501-A Cook Underwood Road
Cook WA, 98605

While employed by the Washington Department of Fish and Wildlife and under contract with the U.S. Fish and Wildlife Service, Mr. Wagner acted as the WDFW project leader in the evaluation fall Chinook survival rates to adulthood relative to flow conditions experienced as outmigrating smolts. The work was

conducted at McNary Dam and involved coded wire tagging and freeze branding of juvenile fall Chinook in representative release groups throughout the summer outmigration period.

1990-1991 Adult Fallback Evaluations **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Rod Woodin **Phone: (360) 902-2700**
Address: Natural Resources Building
1111 Washington Street SE
Olympia WA, 98504

While employed by the Washington Department of Fish and Wildlife, Mr. Wagner acted was the project leader in the evaluation of adult Salmonid downstream passage (fallback) through the juvenile bypass system at McNary Dam. The objectives of this work were to determine if an extension to the McNary juvenile bypass system screening season was warranted to protect adult fallbacks as well as to determine the upstream passage count error resulting from fallback. The work involved: modification to the juvenile bypass system to allow adult trapping, examination, and tagging; round the clock operation of the juvenile bypass system by WDFW personnel; enumeration and handling and tagging of thousands of adult fish; basin wide tag recovery; determination of fish injury and mortality rates; extended operation of the adult fish counting season to allow both manual and video fish counts; weekly and annual reporting; presentation of results at the U.S. Army Corps of Engineers Annual Research Review Conference. This work resulted in the extension of the bypass screening season to protect adult fallbacks at all Walla Walla and Portland District COE projects in the Columbia Basin.

1996-2000 Hanford Stranding Evaluation **Kennewick, Washington**
Washington Department of Fish and Wildlife
Contact: Rod Woodin **Phone: (360) 902-2700**
Address: Natural Resources Building
1111 Washington Street SE
Olympia WA, 98504

While employed by the Washington Department of Fish and Wildlife, Mr. Wagner was the project leader responsible for project design and implementation of this large cooperative multi-year study. This study was co-funded by the Bonneville Power Administration and the Public Utility District of Grant County. Other participants included multiple federal, state, and tribal fishery managers and hydroelectric system managers. The study objectives were to determine susceptibility of: 1) wild juvenile fall Chinook, 2) resident fish, and 3) benthic macro-invertebrates to flow fluctuations resulting from discharge changes at Priest Rapids dam. A fourth objective was to create a susceptibility model for juvenile fall Chinook. The work involved: supervision and training of multiple field crews: oversight of sub-contractors; deployment of artificial substrate for benthic macro-invertebrate sampling; development of an Unsteady Flow model and collection of detailed bathymetry data (SHOALS) for loss estimate determination; habitat assessment; thermal stress assessment; report writing and presentation of results to multiple parties. Mr. Wagner acted as co-chair of the technical advisory committee established for this project.

DETAILED EXPERIENCE

1/04 to date **KWA Ecological Sciences** **Seattle, Washington**
Principal Scientist/ Biologist

Mr. Wagner currently provides client services in the areas of Sub-basin and ESA Recovery Planning, and Monitoring and Evaluation Plan development and implementation in the Columbia Basin. Current work involves Monitoring and Evaluation Plan development for both the Okanogan Sub-basin and the Chief Joseph Salmon Hatchery as well as sub-basin planning in the Crab Creek sub-basin. Work in year 2004 has also included supervision of field crews conducting effectiveness monitoring of SRFB funded projects throughout Eastern Washington. Mr. Wagner has an extensive background in juvenile and adult fish passage facility design, operation and maintenance, passage monitoring, aquatic ecological research, GIS and hydraulic modeling, water quality and habitat assessment, statistical analysis, and general fish

ecology. He has a wide range of project experience in conducting technical field studies developing and utilizing scientifically accepted methodologies. Examples include work with juvenile and adult salmonids, benthic macroinvertebrates, and freshwater resident fish. Mr. Wagner has worked extensively with multi-stakeholder planning groups; state, federal, tribal fisheries groups (U.S. and Canadian); hydroelectric operators, and scientific review committees.

7/00 to 12/03 **Golder Associates** **Redmond, Washington**
Senior Biologist – Ecological Sciences Group
Provided project management, business development, and consulting services in technical fisheries biology with emphasis on Endangered Species Act issues throughout the Columbia Basin. He was responsible for coordinating with Golder technical services to provide solutions to client problems in the areas of U.S/Canada transboundary watershed planning, Limiting Factors Analysis, Hatcheries Genetic Management Plan and Habitat Conservation Plan development, technical project development, and other fisheries population and habitat protection as needed for compliance with ESA and other government regulatory requirements.

5/99 – 7/00 **Washington Department of Fish and Wildlife** **Olympia, Washington**
Fish and Wildlife Biologist 4

7/94 – 5/99 **Washington Department of Fish and Wildlife** **Olympia, Washington**
Fish and Wildlife Biologist 3

3/90 – 7/94 **Washington Department of Fisheries** **Olympia, Washington**
Fish and Wildlife Biologist 3

Duties: McNary, Ice Harbor, and Lower Monumental Dam Smolt Monitoring, Gas Bubble Trauma, and Fish Transportation Oversight program supervisor. Agency representative on Vernita Bar Monitoring Team. Research project leader**:**

McNary Fallback Evaluation (1990-1991): Two year evaluation of adult salmonid downstream passage through the McNary juvenile bypass system. Primary objectives were to assess upstream passage count error and extension of juvenile screening season to minimize turbine passage mortality of adult salmon and steelhead.

Hanford Reach Wild Juvenile Fall Chinook PIT Tag Evaluation (1991-1999): Ongoing monitoring work to assess juvenile wild upriver bright fall chinook migration timing and survival rates.

USFWS/WDFW Fall Chinook Contribution Cooperative Study (1991-1994): Four year study to assess survival rates of adult fall chinook as related to river flow conditions experienced as juvenile outmigrants.

NMFS/WDFW Cooperative Evaluation of the New McNary Juvenile Collection Facility (1994): Quality control assessment of passage conditions for smolts and adult fallbacks through the new collection facility at McNary Dam.

NMFS/WDFW Cooperative Evaluation of the New Ice Harbor Juvenile Bypass Facility (1996): Quality control assessment of passage conditions for smolts and adult fallbacks through the new collection facility at Ice Harbor Dam.

Evaluation of Juvenile Fall Chinook Stranding on the Hanford Reach (1996-2000): Large cooperative research project to determine effect of flow fluctuations resulting from power peaking operations at Priest Rapids Dam on juvenile fall chinook, resident fish, and

benthic macroinvertebrates inhabiting the Hanford Reach of the Columbia River. Development of a Geographic Information System (GIS) based model of river flow changes and chinook susceptibility is also an objective.

Specific Responsibilities: Senior biologist responsible for formulation and management of federal contract budgets totaling approximately $950,000 per year. Supervision of 12-20 professional biologist and technician staff. Program coordination with federal, state, tribal and consultant groups of the Columbia and Snake River basin. Cooperative and independent research planning, implementation, and evaluation. Oversight and management of subcontracted research groups. Hanford Juvenile Fall Chinook Stranding Evaluation Technical Committee Co-chairman. Formal presentations to review committees including:

Northwest Power Planning Council (NPPC), Independent Scientific Review Panel (ISRP), Columbia Basin Technical Management Team (TMT), Washington Fish and Wildlife Commission, U.S. Army Corps of Engineers Anadromous Fish Evaluation Program (AFEP), Hanford Juvenile Fall Chinook Stranding Evaluation Policy and Technical Groups, Environmental Protection Agency (EPA), Columbia Basin Fish Passage Advisory Committee (FPAC), The Bonneville Power Administration (BPA), and others. Agency representative on technical advisory groups related to juvenile bypass system design, operation, and water temperature issues. Environmental Impact Statement review and comment. Establishment and management of multiple field offices. Technical and fiscal reporting.

3/87 – 2/90 **Washington Department of Fisheries** **Olympia, Washington**

Fish Biologist 2

Duties: 1) McNary Fish Transportation Oversight Team (FTOT) representative, 2) Pacific Northwest Environmental Database representative, 3) Unresolved Fish Passage Problem Program physical survey and database work, 4) Baker Lake Spawning Beach supervisor.

Specific Responsibilities: 1) Inspection of McNary juvenile salmonid bypass/transportation system facilities in accordance with FTOT criteria. Oversight of juvenile passage research at McNary Dam. Dissemination of juvenile passage information to federal, state, and tribal fisheries groups of the Columbia basin. Development and implementation of thermal profiling program. Electronic database development. Annual and weekly reporting. 2) Coordination with federal, state, local government and tribal fisheries groups to determine anadromous fish ranges and barriers in Puget Sound tributaries for incorporation into GIS database. 3) Conduct physical surveys of all Skagit and Whatcom county owned anadromous barriers and determination of anadromous habitat potentially available upstream. Statewide anadromous barrier database development. 4) Supervision of technical staff responsible for operation of sockeye/coho spawning beach program located on Baker River system.

TECHNICAL REPORTS

Barkdull B., B. Eby, T. Hillson, W. Spurgeon, and P. Wagner. 1990 Fingerling Collection and Transport Summary. McNary Project. State of Washington. Department of Fisheries. Habitat Management Division. Report to United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077. Task Order Number 9. 52 pages.

Hillson T., P. Hoffarth, S. Lind. W. Price. R. Tudor, and P. Wagner. 1996 McNary Dam, Ice Harbor Dam, and Lower Monumental Dam Smolt Monitoring Program Annual Report. State of Washington. Department of Fish and Wildlife. Fish Management Division. Prepared for United States Department of

Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. BPA Agreement Number DE-FC79-88BP38906. 22 pages.

Hillson T., P. Hoffarth, S. Lind. W. Price. R. Tudor, and P. Wagner. 1997 McNary Dam, Ice Harbor Dam, and Lower Monumental Dam Smolt Monitoring Program Annual Report. State of Washington. Department of Fish and Wildlife. Fish Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. BPA Agreement Number DE-FC79-88BP38906. 23 pages.

Hoffarth P., S. Lind, W. Price, L. Spencer, R. Tudor, and P. Wagner. 1998 McNary Dam, Ice Harbor Dam, and Lower Monumental Dam Smolt Monitoring Program Annual Report. State of Washington. Department of Fish and Wildlife. Fish Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. BPA Agreement Number DE-FC79-88BP38906. 36 pages.

Knapp S., and P. Wagner. 1988 Fingerling Collection and Transport Summary. McNary Project. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077. Task Order Number 7. 57 pages.

Knapp S., and P. Wagner. 1989 Fingerling Collection and Transport Summary. McNary Project. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077. Task Order Number 8. 54 pages.

Nelson W., D. Rondorf, and P. Wagner. Subyearling Chinook Salmon Marking at McNary Dam to Estimate Adult Contribution. 1991. United States Fish and Wildlife Service. Columbia River Research Laboratory. Washington Department of Fisheries. Habitat Management Division. Chapter Three of Identification of Spawning, Rearing, and Migratory Requirements of Fall Chinook Salmon in the Columbia River Basin. 1991 Annual Report. Prepared for U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 91-029. Contract Number DE-AI79-91BP21708. pp 52-62.

Price M., B. Spurgeon, and P. Wagner. 1993 Juvenile Fish Collection and Bypass Report for the Lower Monumental Dam Juvenile Facility. State of Washington. Department of Fisheries. Habitat Management Division. Report to the United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077, Amendment Number 1, Task Order 13. 52 pages.

Price M., B. Spurgeon, and P. Wagner. 1994 Juvenile Fish Collection and Bypass Report for the Lower Monumental Dam Juvenile Facility. State of Washington. Department of Fish and Wildlife. Fish Management Division. Report to the United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077. Task Order 15. 33 pages.

Tiffan K. D. Rondorf, and P. Wagner. Osmoregulatory Performance and Marking of Subyearling Chinook Salmon at McNary Dam to Estimate Adult Contribution. United States Fish and Wildlife Service. Washington Department of Fisheries. Chapter Eight of Identification of the Spawning, Rearing, and Migratory Requirements of Fall Chinook Salmon in the Columbia River Basin. 1992 Annual Report. Prepared for U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 91-029. Contract Number DE-AI79-91BP21708. pp 171-190.

Tiffan K., and P. Wagner. 1993. Osmoregulatory Performance and Marking of Subyearling Chinook Salmon at McNary Dam to Estimate Adult Contribution. United States Fish and Wildlife Service. Washington Department of Fisheries. Chapter Five of Identification of the Spawning, Rearing, and Migratory Requirements of Fall Chinook Salmon in the Columbia River Basin. 1993 Annual Report. Prepared for U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 91-029. Contract Number DE-AI79-91BP21708. pp 108-131.

Tiffan K. R. Garland, and P. Wagner. 1994. Osmoregulatory Performance, Migration Behavior, and Marking of Subyearling Chinook Salmon at McNary Dam to Estimate Adult Contribution. Nation Biological Service. Washington Department of Fish and Wildlife. Chapter Seven of Identification of the Spawning, Rearing, and Migratory Requirements of Fall Chinook Salmon in the Columbia River Basin. 1994 Annual Report. Prepared for U.S. Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 91-029. Contract Number DE-AI79-91BP21708. pp 101-129.

Wagner, P. Smolt Collection, Bypass, and Transportation at McNary Dam on the Columbia River, 1987. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077. Task Order Number 6. 55 pages.

Wagner, P. 1990 McNary Dam Smolt Monitoring Program. Annual Report. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. Contract Number DE-FC79-88BP38906. 20 pages.

Wagner, P. 1991 McNary Dam Smolt Monitoring Program. Annual Report. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. Contract Number DE-FC79-88BP38906. 40 pages.

Wagner, P. 1993 McNary and Lower Monumental Dam Smolt Monitoring Program. Annual Report. State of Washington. Department of Fish and Wildlife. Fish Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. Contract Number DE-FC79-88BP38906. 47 pages.

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Wagner P., and T. Hillson. 1992 McNary Dam Smolt Monitoring Program. Annual Report. State of Washington. Department of Fisheries. Habitat Management Division. Prepared for United States Department of Energy. Bonneville Power Administration. Division of Fish and Wildlife. Project Number 87-127. Contract Number DE-FC79-88BP38906. 55 pages.

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Wagner P., M. Price, S. Lind and B. Spurgeon. 1999 Juvenile Fish Collection and Bypass Report. Lower Monumental Dam Juvenile Facility. State of Washington. Department of Fish and Wildlife. Report to the United States Army Corps of Engineers. Contract Number DACW-68-82-C-0077.

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Gadomski, D.M. and P.G. Wagner. 2005. Effects of flow fluctuations on age-0 resident fishes in shorelines of the Hanford Reach of the Columbia River. Northwest Science. In Draft.

Mesa, M.G., L.K. Weiland, and P.G. Wagner. 2002. Effects of Acute Thermal Stress on the Survival, Predator Avoidance, and Physiology of Juvenile Fall Chinook Salmon. Northwest Science, Vol 76. No. 2, 2002. pp 118-128.

Tiffan, K.F., D.W. Rondorf, and P.G. Wagner. 2000. Physiological Development and Migratory Behavior of Subyearling Fall Chinook Salmon in the Columbia River. North American Journal of Fisheries Management 20:28-40.

PAST AND PRESENT AFFILIATIONS

American Fisheries Society Member
Hanford Stranding Evaluation Technical Committee Co-Chair
AFS Pallid Sturgeon Propagation and Genetics Sub-committee Member
Fish Transportation Oversight Team Representative
Yakima Basin Growth Management Act Scientific Advisory Group Member
McNary Water Temperature Assessment Committee Member
Vernita Bar Monitoring Team Member

ATTACHMENT: 2005 STATEMENT OF WORK FOR BPA PROJECT NUMBER 200302200

2005 Statement of Work
Performance and Budget Period: March 1, 2005 – February 28, 2006

Project title: Design and Conduct Monitoring and Evaluation Associated with Re-establishment of Okanogan Basin Natural Production.

Project number: 200302200

Technical Contact: John Arterburn, Fisheries Biologist II
Colville Confederated Tribes, Fish and Wildlife Department
23 Brooks Tracts Rd. Omak, WA 98841(509) 422-7424
john.arterburn@colvilletribes.com

Contracting Contact: Cindy McCartney, Administrative Assistant
Colville Confederated Tribes, Fish and Wildlife Department
P.O. Box 150, Nespelem, WA 99155
(509) 634-2126
cindy.mccartney@colvilletribes.com

Project goal: *The monitoring plan proposed requires a long-term commitment as most outcomes will not be realized for 7 to 20+ years. This project is designed to ultimately achieve these goals:*

1. Determine if there is a statistically significant difference in biological parameters of summer/fall, spring Chinook, sockeye, and steelhead in the Okanogan basin (7-20+ year time frame).

2. Determine if there is a statistically significant difference in selected physical habitat parameters and characteristics for the Okanogan basin resulting from the cumulative benefits of habitat actions (7-20+ year time frame).

3. Determine if there is a statistically significant difference in selected water quality parameters for the Okanogan basin (7-20+ year time frame).

4. Research selective fishing gears for potential effectiveness and sites, and possible future use for selective Tribal subsistence fisheries. This work will be closely aligned and coordinated with the Colville Tribal Hatchery Master Plan (1-5+ year time frame).

5. Conduct a baseline Okanogan Basin inventory & analysis to: a. Collect data, to raise physical habitat data to an empirical level for use in EDT. b.) Collect data on historical and current fish population distributions, and c.) Collect passage and

other watershed assessment information throughout the basin for use in EDT modeling runs or to assist in future enhancement planning processes (1-20+ year time frame).

The plan is designed to address these questions and at the same time eliminate duplication of work, reduce costs, and increase monitoring efficiency. The implementation of valid statistical designs, probabilistic sampling, standardized data collection protocols, consistent data reporting methods, and selection of sensitive indicators will increase monitoring efficiency. For this plan to be successful, all organizations involved must be willing to cooperate and freely share information. Cooperation includes sharing monitoring responsibilities, adjusting or changing sampling methods to comport with standardized protocols, and adhering to statistical design criteria. In those cases where the standardized method for measuring an indicator is different from what was used in the past, it may be necessary to measure the indicator with both methods for a few years so that a relationship can be developed between the two methods. Scores generated with a former method could then be adjusted to correct for any bias.

Primary Goal for 2005: To complete initial design of a basin wide monitoring and evaluation program and begin limited data collection and construction of the needed infrastructure. This monitoring and evaluation program will provide status and trend data for all anadromous fish species in the Okanogan River basin for the next 20 years

Background: A coordinated and comprehensive approach to the monitoring and evaluation of status and trends in anadromous and resident salmonid populations and their habitats is needed to support restoration efforts in the Columbia Cascade Province and in the Okanogan subbasin in particular. Currently, independent research projects and some monitoring activities are conducted by various state and federal agencies, tribes, and to some extent by watershed councils or landowners, but there has been no overall framework for coordination of efforts or for interpretation and synthesis of results until now.

Managers often implement actions within tributary streams to improve the status of fish populations and their habitats. Until recently, there was little incentive to monitor such actions to see if they met their desired effects. Many programs require that funded actions include monitoring efforts and coordinated measures to reduce duplication or contrary effort and to provide a process for more universal reporting and strategic planning. Within the Upper Columbia Basin in Washington State, several different organizations, including federal, state, tribal, local, and private entities currently implement tributary actions and conduct independent monitoring studies. Because goals and objectives are unique for each project; entities are using different monitoring approaches and protocols. In some cases, different entities are measuring the same (or similar) things in the same streams with little coordination or awareness of each others efforts. The Upper Columbia Regional Technical Team (RTT) is aware of this problem and desires a monitoring

strategy or plan that reduces redundancy, increases efficiency, and meets the goals and objectives of the various entities.

We propose that the structure and methods employed by the Monitoring Strategy for the Upper Columbia Basin (Hillman 2004, Nichols1997a; 1997b; 1999) be extended to the Okanogan subbasin of the Columbia Cascade Province. This approach is fully consistent with the original 2003 project proposal for the Okanogan M&E program. This project is high priority based on the high level of emphasis the NPCC Fish and Wildlife Program, Subbasin summaries, NOAA fisheries guidance, and the emphasis Independent Scientific Review Panel have placed on monitoring and evaluation. The overall goal of this program is to provide the real-time data to guide restoration and adaptive management in the region.

The Okanogan M&E program itself is specifically designed to monitor key components of the ecosystem including biological, physical habitat, and water quality parameters. The program will also contain components to develop baseline assessments were data are currently unavailable and preliminary studies using selective fisheries gear types will be initiated.

We will implement the EMAP sampling framework, a statistically based and spatially explicit sampling design, to quantify trends in physical habitat, water quality, and biological parameters. Up to 30 spatially balanced, randomly selected reaches will be sampled for physical, biological, and water quality parameters in the Okanogan River subbasin from late March through November annually starting in 2005.

Scope of Work – Breakdown

Work Element 1: Develop RM&E Methods and Design

Work Element Title: Develop field protocols for biological and water quality sampling.

Deliverable: Field protocol manual

Deliverable Description/Specs: Determine the best and most appropriate field protocols for collecting data related to biological and water quality sampling. Biological protocols will include macro invertebrate, smolts trapping, snorkeling, other items that will be considered will include redd surveys, and adult enumeration as deemed appropriate and necessary. Water quality sampling will include monitoring for flow, temperature, conductivity, turbidity, dissolved oxygen, bed scour other indicators will be considered and added as necessary and appropriate.

Milestones:

Title	Start Date	End Date	Description
Preliminary draft of	3/05	6/05	Field protocols will follow already established

biological protocols			format (see physical habitat protocols), this is a working draft of most protocols.
Preliminary draft of water quality protocols	6/05	9/05	Field protocols will follow already established format (see physical habitat protocols), this is a working draft of most protocols.
Peer-reviewed final draft of biological protocols sent to BPA	9/05	12/05	Field protocols will follow already established format (see physical habitat protocols), this is a final draft of all appropriate protocols.
Peer-reviewed final draft of water quality protocols sent to BPA	12/05	3/06	Field protocols will follow already established format (see physical habitat protocols), this is a final draft of all appropriate protocols.

Additional Notes: Protocols will be developed based on information collected from the upper Columbia Strategies and additional reference materials developed from the CSMEP and PNAMP processes. To insure compatibility with other regional and basin wide projects that are underway we will coordinate our activities with multiple disciplines and agencies throughout the Okanogan River basin, Columbia Cascade Province, and Columbia River Basin.

Monthly meetings will be conducted with local agencies, project leaders of other Okanogan Basin M&E efforts, and consultants that provide specialized knowledge. The primary purpose of these meetings will be to maintain consistency, and provide a conduit for information, and data exchange. The results of these meetings will add considerably to protocol development that will dictate what data will be collected and by whom, in the future under this project.

Estimated Level of Effort: 2 fisheries biologist for 1 month.

Work Element 2: Obtain Permits

Work Element Title: Develop and submit permit applications for installing traps, weirs, video counting stations, gauging stations, and other necessary infrastructure for collecting biological, water quality, and physical habitat data.

Deliverable: Federal, State, and other necessary permits
Deliverable Description/Specs: Several

Milestones:

Title	Start Date	End Date	Description
Submit application for section 10 permit to NOAA Fisheries and BPA	3/1/2005	6/15/2005	
Receive section 10 permit for M&E project.	5/15/2005	8/15/2006	

Complete/submit HPA and other applicable state and county permits	3/1/2005	6/15/2005	
Complete any additional federal permits (i.e. army corp. 404 etc..)	3/1/2005	6/15/2005	
Receive other needed permits	6/15/2005	12/15/2005	

Additional Notes: Receive authorization by regulatory agency to install needed infrastructure items and collect biological data related to this monitoring and evaluation effort. This work element will minimize the potential negative impacts of this project.

Estimated Level of Effort: 1 fisheries biologist for 2 months.

Work Element 3: Produce Progress Reports

Work Element Title: Produce quarterly and annual reports based on tasks identified within this scope of work.

Deliverable: Three quarterly and one annual report

Deliverable Description/Specs: Annual and quarterly reports for activities identified within this proposal. Annual reports will be consistent with the terms and conditions of this contract.

Milestones:

Title	Start Date	End Date	Description
Annual report	3/1/2005	6/1/2005	For project activities from 3/04 through 2/05, including quarterly reporting for 12/04 to 2/05
Quarterly report	3/1/2005	6/1/2005	For project activities from 3/05 through 5/05
Quarterly report	6/1/2005	9/1/2005	For project activities from 6/05 through 8/05
Quarterly report	9/1/2005	11/1/2006	For project activities from 9/05 through 11/05

Estimated Level of Effort: 1 fisheries biologist for 1 month.

Work Element 4: Manage Projects

Work Element Title: Manage Projects: produce invoices, accrual estimates, etc.

Deliverable: Invoices, accrual estimates, purchase orders, employee records etc.

Deliverable Description/Specs: Maintain files to include copies of sub-contracts, hours by staff, purchase orders for necessary items. Complete processing of accounts payable, invoices, employee hiring packets, and

subcontracts as needed to complete tasks identified in this scope of work. Produce accrual estimates and other financial tasks requested by BPA.

Milestones:

Title	Start Date	End Date	Description
Project administration 25% complete	3/1/2005	5/30/2005	Respond to all request for information for BPA and Tribal departments during this timeframe.
Project administration 50% complete	6/1/2005	8/30/2005	Respond to all request for information for BPA and Tribal departments during this timeframe.
Project administration 75% complete	9/1/2005	11/30/2005	Respond to all request for information for BPA and Tribal departments during this timeframe.
Project administration 100% complete	12/1/2005	2/28/2006	Respond to all request for information for BPA and Tribal departments during this timeframe.

Additional Notes: This task will be on-going to better track progress of individual tasks, products, and expenses.

Estimated Level of Effort: 1 fisheries biologist, 1.0 month; Staff assistant 6.0 months.

Work Element 5: Project coordination/public outreach

Work Element Title: Project coordination/public outreach.

Deliverable: Documentation of landowner contacts and contacts with other Monitoring and Evaluation efforts within the region.

Deliverable Description/Specs: OBMEP biologist staff will contact and coordinate directly with other entities performing M&E related activities within the region to ensure compatibility with other regional M&E and salmon recovery efforts. Private landowners will also be contacted under this task so that OBMEP field personnel may gain access to EMAP sampling sites. Landowner contacts and other coordination activities will be documented.

Milestones:

Title	Start Date	End Date	Description
Regional Coordination and Landowner Contacts	3/01/05	5/31/05	Conduct coordination with regional M&E entities. Contact private landowners and secure access permission for first half of remaining EMAP sampling sites.
Regional Coordination and Landowner Contacts	6/01/05	8/31/05	Conduct coordination with regional M&E entities. Contact private landowners and secure permission for final half of remaining EMAP sampling sites.
Regional Coordination	9/1/05	11/30/05	Conduct coordination with regional M&E entities to ensure OBMEP regional

			compatibility.
Regional Coordination	12/1/05	2/28/06	Conduct coordination with regional M&E entities to ensure OBMEP regional compatibility.

Additional Notes: The OBMEP was developed under a regional Monitoring and Evaluation scheme involving coordination with multiple entities to ensure that all M&E efforts are compatible throughout the Columbia Basin and the region. Continued coordination with these entities will be necessary as region wide M&E efforts continue to evolve. This is a fundamental part of the program. The Okanogan subbasin is a transboundary watershed and therefore coordination with Canadian entities will be necessary as well.

The OBMEP utilizes a GRTS EMAP sampling design provided by the EPA. Under this sampling design, 150 sampling sites (90 U.S., 60 Canadian) are randomly selected throughout the Okanogan watershed. As many of these sites fall within areas of private ownership, landowners must be contacted (public outreach) and access granted before field crews can conduct surveys. In year 2004, landowners were contacted and permission granted as necessary to access the 12 annual panel sites surveyed. Landowners will continue to be contacted in year 2005 to secure access to as many of the 150 EMAP sampling sites as possible.

Estimated Level of Effort: Fishery Biologist for 1 month, Staff Assistant for 3 months, ONA Technician for 6 months (This staff person will assist with several data collection tasks).

Work Element 6: Complete, manage, and maintain database

Work Element Title: Complete, manage, and maintain database.

Deliverable: A Data Management System will be developed to handle the collection, maintenance, and subsequent analysis and reporting of monitoring and historic data collected for the OBMEP Program. CCT staff will be trained as necessary in database use.

Deliverable Description/Specs: The OBMEP Monitoring Database system will be developed to include the following:

Item 1. Tables, forms, and queries designed for import of field data.
Item 2. Forms and procedures for import of existing field data and data from hand-held data collectors into the OBMEP Monitoring Database.
Item 3. Training of CCT staff in database use, use of handheld data collectors, and import of existing field data into OBMEP database.
Item 4. Database for import of bibliographic information on contents of historic data repository.

Item 5. Import of data from historic data repository into the OBMEP Monitoring Database as-needed.
Item 6. Planning and development of standardized output routines for export of data from the OBMEP Monitoring Database for well-defined output needs such as identified by the CCT, NOAA Fisheries, BPA, and other fish and wildlife managers.
Item 7. Standardized query tools for well-defined outputs (such as EDT, EMAP, PISCES, etc.) from the OBMEP Monitoring Database. In addition, an ad-hoc query tool for on-the-fly outputs from the OBMEP Monitoring Database will also be developed.

Milestones:

Title	Start Date	End Date	Description
Initial database design and implementation	3/01/05	5/31/05	Deliverable Item 1
Develop procedures for import of existing (2004) field data and future data from hand-held data collectors (2005 and beyond).	5/01/05	7/15/05	Deliverable Item 2
Training of CCT staff in database use, hand-held data collectors, and migration of existing field data into database.	7/16/05	8/15/05	Deliverable Items 3
Cataloging and import of data from historic data repository into monitoring database	3/01/05	2/28/06	Deliverable Items 4 and 5
Planning and development of standardized output routines	3/01/05	2/28/06	Deliverable Item 6
Development of standard and ad-hoc database output procedures	9/01/05	12/31/05	Deliverable Item 7

Additional Notes: To summarize data management activities to date, there is ongoing collection of field data in the Okanogan basin to support limited status and trend analysis. The sampling protocols for future development are being developed. Thus far, data have been collected and hand entered into paper forms in the field. Beginning in year 2005 field season, data will be collected electronically using hand-held data collectors. All of this field data will need to be migrated into the OBMEP database.

In addition, past efforts to assemble an extensive collection of aquatic data supporting trend analysis will be migrated into the OBMEP database. These data are in a variety of formats. Selected portions of these data will need to be ingested into a database structure to make it available for further comparison and consideration in analysis. The data may be in nearly any physical format (database, table, scanned image, paper, graph, etc.) yet will need to be migrated into one common database system.

Estimated Level of Effort: 1 Fishery Biologist for 1 month, 1 Field Technician for 1 month

Work Element 7: Design, build, and install video counting equipment

Work Element Title: Design, build, and install Video Counting Equipment

Deliverable: Equipment for video counting of adult salmonids constructed and installed

Deliverable Description/Specs: To enumerate adult salmonids in the Okanogan Basin we will use video counts to get a complete census of fish entering the Okanogan River, fish entering Canada, and fish entering the tributary habitats. To census fish returns to the Canadian portion of the Okanogan River video cameras will be installed at Zosel Dam. To monitor the salmonids entering tributary habitats annual counts will be conducted at the Omak Creek weir and up to 4-portable video camera arrays and picket weirs will be installed in a rotating panel of all anadromous tributaries once every five years. Conceptual design elements for a video counting facility to be built near Malott, WA will be completed.

Milestones:

Title	Start Date	End Date	Description
Develop RFP for construction of portable video weirs and cameras at Zosel Dam	3/1/2005	5/1/2005	Develop RFP and contract consultant to install video cameras at Zosel Dam
Install Video Cameras at Zosel Dam	5/1/2005	9/1/2005	Have cameras installed and operational by the end of August to enumerate fall returns in 2005
Design and construct portable video weirs	5/1/2005	9/1/2005	Have portable video weirs constructed for use in enumerating summer steelheads returns in 2006
Design for Malott Video counting facility	9/1/2005	2/28/2006	Develop design for construction of a video counting weir to be located near Malott, WA.

Additional Notes: Video counting systems are needed to enumerate salmon in the Okanogan River basin. This infrastructure will utilize technology that has the least negative impacts to migrating fish yet produce an accurate census of fish entering the

Okanogan River and its tributaries. Special emphasis will be given to enumerating summer steelhead as they are listed as endangered.

Estimated Level of Effort: 1 fisheries biologist for 3months.

Work Element 8: Install, operate, and maintain real-time discharge and temperature gauging sites

Work Element Title: Install, operate, and maintain real-time gauging stations in the Okanogan Basin.

Deliverable: Installed gauging station and real-time discharge and temperature data up to 4-additional creeks and expanded real-time temperature information at existing USGS Okanogan River main-stem sites.

Deliverable Description/Specs: Real-time data collection at gauging stations is critical to fisheries and regulatory agencies. The Okanogan River watershed has several tributaries that provide little information on discharge or temperature but these parameters are known to be limiting in several tributaries throughout the Okanogan River basin. By expanding the existing suite of gauging station sites considerable additional data can be collected with on-going operation and proper maintenance.

Milestones:

Title	Start Date	End Date	Description
Develop contract or MOA with DOE, USGS, ONA, OID, and Environment Canada to modify and develop stream gauges in the Okanogan Basin	3/1/05	6/30/05	Develop the contract or agreements to install, operate, and maintain water quality gauging sites that monitor both temperature and discharge in the Okanogan drainage. We will pursue cost share wherever possible.
Upgrade existing USGS discharge gauges to include temperature	4/30/05	6/30/05	Install real-time temperature monitoring instrumentation to existing USGS gauging stations located along the Okanogan River.
Install new discharge and temperature monitoring gauges	7/1/05	12/30/05	Install up to 4-new real-time stream gauging sites that measure at a minimum discharge and temperature.
Operate and maintain stream gauging sites	4/30/05	2/28/06	On-going cost associated with operating expanded sites.

Additional Notes: Several possible agencies are involved in collecting water quality data within the Okanogan River basin. Each entity has unique jurisdictional boundaries so it will be necessary to coordinate these activities and ensure that contracts or memorandums of agreement are in place prior to data collection or equipment installation begins. Cost share will be pursued wherever possible.

Estimated Level of Effort: 1 fishery biologist, 2 months, 1-FTE contracted to Washington Department of ecology to operate and maintain water quality gauging stations throughout the Okanogan river basin in the U.S.

Work Element 9: Collect water quality data

Work Element Title: Collect water quality data from 30 EMAP sites located throughout the Okanogan River basin

Deliverable: Water Quality data from 30 randomly selected EMAP sites.

Deliverable Description/Specs: Water quality data will consist of temperature, dissolved oxygen, turbidity, conductivity, pH, total dissolved solids, and others as deemed necessary. These data will be collected monthly at each of the 30 randomly selected EMAP sites within the Okanogan River drainage.

Milestones:

Title	Start Date	End Date	Description
90 samples completed	3/1/05	6/1/05	25% of water quality samples collected
180 samples completed	6/1/05	9/1/05	50% of water quality samples collected
270 samples completed	9/1/05	12/1/05	75% of water quality samples collected
360 samples completed	12/1/05	2/28/06	100% of water quality samples collected

Additional Notes: Water quality data is important to both fisheries managers and regulators therefore this information will be made available to other managers and agencies through the web and project specific server or through stream-net.

Estimated Level of Effort: 1 fishery biologist, 1 month, 1 fishery technician 12 months, this task might be cost shared with the above effort if possible through collaboration with the Washington Department of Ecology.

Work Element 10: Physical Habitat Data Collection

Work Element Title: Collection of physical habitat data at EMAP sampling sites.

Deliverable: Physical habitat data for 30 EMAP sampling sites.

Deliverable Description/Specs: Physical habitat data will be collected at 30 (15 annual panel, 15 rotating panel) EMAP sampling sites consistent with Upper Columbia Monitoring and Evaluation Strategy protocols as adopted by the Okanogan Basin Monitoring and Evaluation Program.

Milestones:

Title	Start Date	End Date	Description
Physical Habitat Surveys	7/01/05	7/31/05	Collection of physical habitat data under pre-established regionally accepted protocols at

			sites 1-10.
Physical Habitat Surveys	8/01/05	8/31/05	Collection of physical habitat data under pre-established regionally accepted protocols at sites 11-20.
Physical Habitat Surveys	9/1/05	9/30/05	Collection of physical habitat data under pre-established regionally accepted protocols at sites 21-30.

Additional Notes: Physical habitat data will be collected under pre-established protocols at 15 annual and 15 rotating sampling sites per EMAP GRTS six panel sampling design. The 15 rotating sites will be verified and monumented prior to the physical habitat surveys (site verification and monumenting for annual sites was completed in 2004). Physical habitat data will be collected on Trimble GPS data loggers. Information will be collected pertaining to presence and composition of large woody debris; riparian vegetation structure; canopy cover; human disturbance; substrate composition; embeddedness; side channel habitat; stream channel habitat types (pool, riffle, glide, etc.) and channel widths and depths.

Estimated Level of Effort: 1 Biologist for 3 months, 3 Technicians for 3 months

Work Element 11: Collect Biological Data

Work Element Title: Collect data on adult and juvenile anadromous fish, redd counts and macro invertebrates in the Okanogan River and selected tributaries.

Deliverable: Data on abundance and distribution of juvenile and adult anadromous fish, macro invertebrates and redds.
Deliverable Description/Specs: We will be installing and testing smolt traps in one location on the Okanogan River and Installing video cameras at Zosel Dam for adult enumeration (both permit dependant). We will survey the Okanogan River and anadromous fish producing tributaries for redds, macro invertebrates, juvenile and adult fish.

Milestones:

Title	Start Date	End Date	Description
Smolt trapping: planning, permitting, testing	4/1/05	6/30/05	Designing and purchasing traps, identifying trap location, planning placement, testing trap efficiency, training staff on operation
Redd Counts	3/1/05	5/15/05	Over flights and/or ground surveys of the Okanogan River and tributaries for Steelhead redds
Snorkeling	7/15/05	10/1/05	Snorkeling at 30 EMAP sites (15 annual, 15 rotating panel) looking for adult and juvenile anadromous fish.

Macro Invertebrate Sampling	7/1/05	10/1/05	Surveying in conjunction with habitat surveys for macro invertebrates.
Adult enumeration	9/1/05	2/28/05	Establishing video counting stations at Zoesel dam and up to four anadromous fish producing tributaries. Collection and analyzation of the data from the video cameras.

Additional Notes: Smolt trapping, snorkeling, redd counts, adult enumeration and macroinvertebrate sampling will all be done following protocols established by the Colville Confederated Tribes and contributors as identified in an earlier work element. There will be a high level of coordination with planners, permitters and other data collection agencies to achieve the best data available.

Estimated Level of Effort: Smolt trapping- Biologist for 2 months, 2-technicians for 2 months, Snorkling- Biologist for 1 months, 3-technicians for 1 months, Macro invertebrate sampling (included in habitat sampling), Adult enumeration Biologist for 3 months, technicians for 6 months, Redd surveys- Biologist for 3 months, technicians for 3 months.

Work Element 12: Baseline Stream Data assessment

Work Element Title: Stream survey and data collection at selected tributaries (McIntire Creek, Park Rill Creek and Shuttleworth Creek).

Deliverable: Report on condition and habitat potential of selected tributaries
Deliverable Description/Specs: We will be gathering data on width to depth ratios, gradients, barriers and selected habitat parameters along watsheds that have only minimal data.

Milestones:

Title	Start Date	End Date	Description
Baseline stream data assessment	4/15/05	5/15/05	Gathering data on width to depth ratios, gradients, barriers and selected habitat parameters at some tributary sites. Report writing.

Additional Notes: Data gathered by the Colville Confederated Tribe will help to determine the condition of tributaries for anadromous fish production. We will then

be able to develop a better idea of habitat potential throughout the Okanogan basin and generate plans for recovering these habitats..

Estimated Level of Effort: 2 Fisheries Biologist for 1 month.

Work Element 13: Analyze and Interpret data

Work Element Title: Analyze collected and historic data on habitat, biological and water quality parameters.

Deliverable: Data summaries of habitat, biological and water quality parameters.
Deliverable Description/Specs: We will be gathering data on habitat, water quality, anadromous fish and macro invertebrate biology as defined in our protocols. We will then synthesize our collected data and data gathered by other agencies and individuals into usable summary tables and graphs. We will work with the EPA to analyze and interpret, and statistically test our collected data and then make decisions if we need different or more comprehensive data collection techniques in future years.

Milestones:

Title	Start Date	End Date	Description
Analyze and interpret data	11/1/05	2/28/06	Synthesize data collected to develop models, interpret results, and run statistical analysis.

Additional Notes: Data gathered by the Colville Confederated Tribe and other agencies and individuals working in the Okanogan Basin will be synthesized and interpreted to confirm that all crucial data is being collected and that we will be able to draw conclusions from this data when once a long-term data set is established. Additional analysis will occur as part of the annual report writing task as necessary.

Estimated Level of Effort: 2 Fishery biologists for 4 months.

Work Element 14: Workshop/conference attendance and publications

Work Element Title: Workshop/conference attendance and publications.

Deliverable: Professional presentations, peer reviewed publications.
Deliverable Description/Specs: OBMEP staff biologists will periodically attend relevant workshops/conferences as scheduled within the region to exchange information with or provide presentations to other fisheries scientists. Peer reviewed journal publications may also be developed stochastically under this task.

Milestones:

Title	Start Date	End Date	Description
Workshops/Conferences	3/01/05	5/31/05	Workshop/conference attendance.
Workshops/Conferences	6/01/05	8/31/05	Workshop/conference attendance.
Workshops/Conferences	9/1/05	11/30/05	Workshop/conference attendance.
Workshops/Conferences	12/1/05	2/28/06	Workshop/conference attendance.

Additional Notes: Workshops and conferences are periodically held by the American Fisheries Society and other entities within the Columbia Basin and offer an important forum for information exchange between fisheries scientists. OBMEP biologists will attend these events and provide formal presentations about OBMEP. Peer reviewed journal publications may also be completed under this task as needs or oppertunities arise.

Estimated Level of Effort: 2 fishery biologists for 1 month